HYDROGEN-OXYGEN ELECTROLYTIC REGENERATIVE FUEL CELLS

Prepared for

National Aeronautics and Space Administration
Lewis Research Center
21000 Brookpark Road
Cleveland 35, Ohio
Attn: D. G. Soltis

Contract NAS 3-2781

EOS Report 4110-M-7

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Prepared by

Harvey Frank
Harvey Frank
Project Supervisor

Approved by:

E. Findl
Manager, Chemical and
Fluid Systems

A. R. Tanguay
A. R. Tanguay
Manager
Energy Conversion Division

ELECTRO-OPTICAL SYSTEMS, INC. Pasadena, California

1. INTRODUCTION

This report briefly reviews the progress made on the development of a rechargeable fuel cell (NAS Contract 3-2781) during the month of March, 1964. A complete description of the results obtained during the month, including the latest test series, will be given in the final report.

2. TECHNICAL DISCUSSION

As indicated in the last monthly report, the six cell unit was found to malfunction each time it was tested. The source of the malfunctions was attributed to internal gas mixing.

Before proceeding with the next test series, an extensive investigation was carried out in order to find the source of the gas mixing. This investigation revealed that the diffusion rate through the asbestos matrix was much higher than had been anticipated. Subsequent investigations revealed that the asbestos which had been employed in the tests was of a different grade than had been employed on previous cells.

The unit was subsequently reassembled with the impermeable grade of asbestos, and readied for the final 48 hour test series. A differential pressure transducer was also installed for this test in order to gain further understanding of the internal mechanisms.

The unit was found to function very well for 7 complete and 2 partial cycles. The average charge voltage was 9.6 volts at a current of 9.6 amps, and the discharge voltage was 4.4 volts at a current of 16.6 amps. Both charge and discharge voltages were relatively constant for the complete cycle, i.e., 76 min. charge, and 37 min. discharge. At the end of the ninth cycle, however, another malfunction occurred. The internal pressure and temperature increased suddenly, then declined slowly, and the voltage fell to zero. Disassembly and inspection

revealed signs of another internal ignition. The source of this ignition was most probably a dry spot on one of the electrodes.

This last series of tests demonstrated performance superior to that of previous ones, and indicates that part of the original problem was associated with the old type of asbestos matrix. The combustion problem is not completely solved, however, as evidenced by the latest malfunction. A complete analysis will be given in the final report.

3. PLANS FOR APRIL

A final series of tests is being scheduled for the third week of April. The cell has been modified by the removal of the 50-50 Pd/Pt hydrogen electrode and its replacement with a Pt electrode. In addition, a reinforced pressure diaphragm of somewhat larger volume is being installed.

The final report has been started, and will be completed approximately on schedule.

4. FINANCIAL STATEMENT

Man hours and Dollar Expenditure for Period Mar. 1--April 3, 1964

Direct Labor Hours	530.5
Direct Labor Dollars	$3,521.24
Purchases and Commitments	$1,014.83
Total Dollar Expenditure	$9,760.73